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SYNOPSIS OF THE GENUS XANTHOCEPHALUM (COMPOSITAE)

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Xanthocephalum is a small genus of homochromous *Compositae-Astereae*. It is composed of stout annuals or short-lived perennials which are characterized by a reduced pappus, glutinous campanulate or hemispheric involucre, and conspicuous yellow-rayed heads with a relatively large number of flowers, both ligulate and tubular. The genus is found in central and northern Mexico, from the state of Puebla to the United States border and in southern Arizona, New Mexico and Texas.

The present investigation was prompted by the lack of any taxonomic work covering the species in their entirety. Its aim is therefore only to delimit somewhat precisely the taxa and to present a key to the species, and is not intended as a monograph. In a previous paper (Solbrig, 1960), the characters of *Xanthocephalum* and related genera were discussed. The present investigation supplements that work by correcting information presented there and by adding some new data on generic characters.

Material from the Gray Herbarium (GH) of Harvard University, the U. S. National Herbarium (US), and the herbaria of the University of California at Berkeley (UC) and the University of Michigan (MICH) was examined. In addition, type material from these herbaria and the Royal Botanical Gardens, Kew (K) was examined. To the direc-

[1]I am very grateful to Dr. Carroll Wood for reading the manuscript and making valuable suggestions.

tors and curators of all these institutions I am very grateful for making the material in their custody available.

HISTORY OF THE GENUS

Xanthocephalum was described by Willdenow in 1807, apparently based on material collected and described by Humboldt. No specific name was given in the original description. Kunth (Humboldt, Bonpland and Kunth, 1820) referred the species *X. centauroides* (without a description) to Willdenow's description, stating that he had not seen any material of it. This is, to my knowledge, the first specific epithet ascribed to *Xanthocephalum*, and may therefore be considered the type species. In the same work, Kunth described the genus *Xanthocoma* with the species *X. humile*. He also redescribed *Xanthocephalum centauroides* as *Pyrethrum Bonplandianum*. Lessing (1832) realized the true identity of *Pyrethrum Bonplandianum* Kunth, but not that of *Xanthocoma humile* which he maintained. De Candolle (1836, 1837) also accepted both genera, describing a new species of *Xanthocephalum*, *X. suffruticosum*. He failed to realize the true identity of *Pyrethrum Bonplandianum*, with the result that he coined the name *Xanthocephalum Bonplandianum*, and redescribed under *X. suffruticosum*, what is in reality, *X. centauroides*. Another new species of *Xanthocephalum* is described by him as *Keerlia linearifolia*. In 1852 Asa Gray transferred this last to the genus *Gutierrezia* in which, the epithet *linearifolia* being preoccupied, he coined the combination *Gutierrezia Alamani*. A year later, Gray described two more species of *Xanthocephalum* under *Gutierrezia*: *G. gymnospermoides* and *G. Wrightii*. In 1857 Regel, realizing that *Gutierrezia gymnospermoides* is not a true *Gutierrezia*, but apparently unaware of the existence of *Xanthocephalum*, described *Guenthera viscosa*, based on *Gutierrezia gymnospermoides* Gray. The following year, still another name, *Grindeliopsis* (invalid according to the present rules) was created for the same plant by Schultz Bipontinus. George Bentham (Bentham and Hooker, 1873) recognized the synonymy of all these generic names. In 1880, Asa Gray accepted Bentham's concept and described still another species, *Xanthocephalum sericocarpum*. Hemsley (1881-82) in *Biology of Central America* attempted the first and only revision of the genus. He also described in

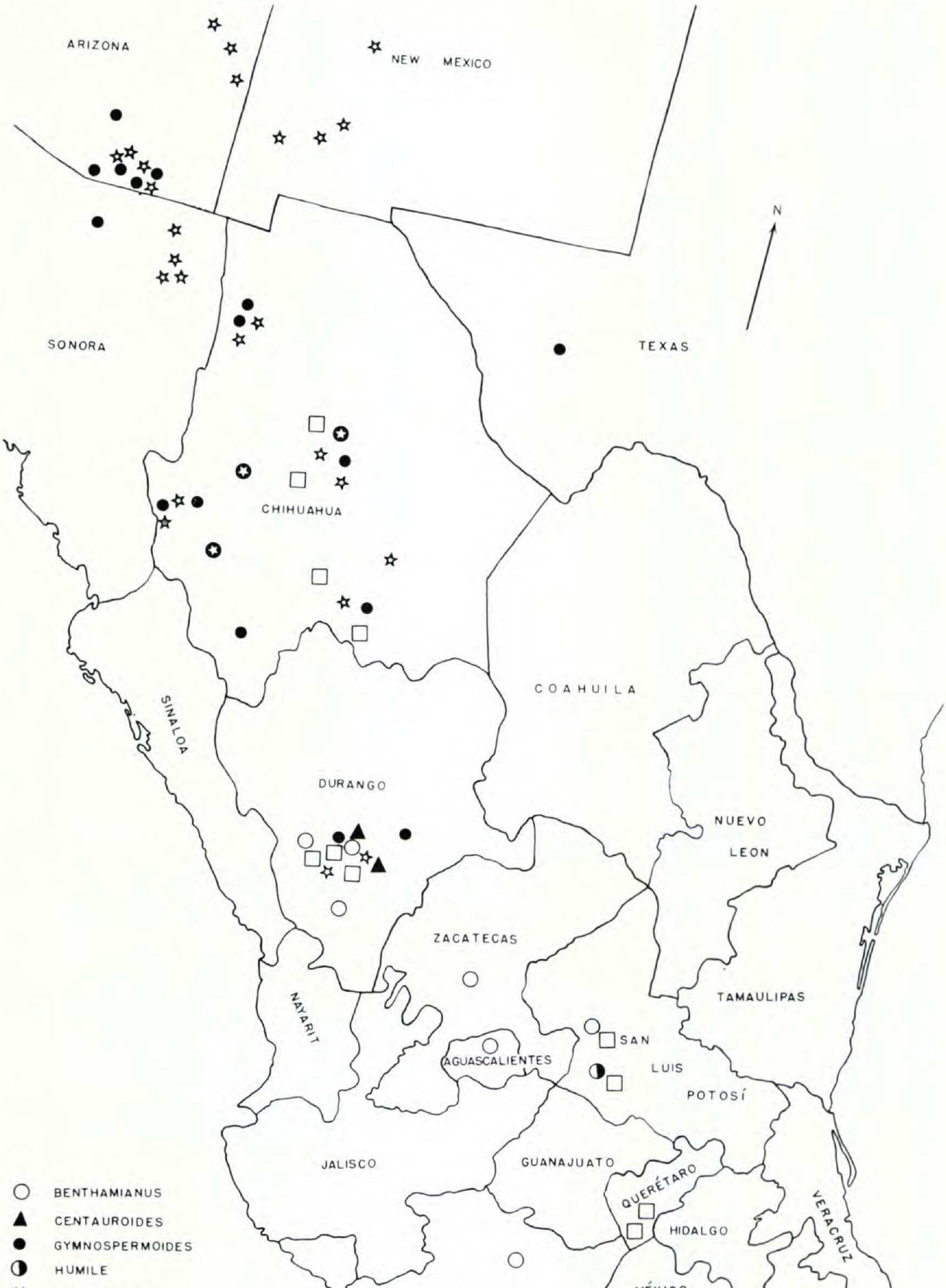

FIG. 1. Distribution of the species of *Xanthocephalum*. Each symbol represents a locality, regardless the number of collections. Above, for Benthamianus, read Benthamianum.

that work two new species. Since then new species have been described by Fernald (1901) and Robinson (1893). Thus in all, four generic names and over fifteen species have been ascribed to *Xanthocephalum*.

MORPHOLOGICAL AND CYTOLOGICAL CHARACTERS

A detailed comparative account of the principal morphological features has been presented elsewhere (Solbrig, 1960). It should be added that, contrary to what was stated then, not all species of *Xanthocephalum* are annuals, a few being short-lived perennials. Nevertheless, none are globose shrubs like species of *Gutierrezia* and *Amphipappus*. Likewise, the blooming period is not strictly fall (that is the period between September 21 and December 21), but late summer and fall. This applies to all the genera indicated in that work as fall bloomers. Nevertheless no species blooms normally in the spring, as is the case with *Amphipappus*. It may be added that most species of *Xanthocephalum* seem to be restricted to the mountainous areas of central and northwestern Mexico and border areas of the United States, usually in dry pine forests. Two species are adapted to marshy habitats in central Mexico (fig. 1).

Xanthocephalum gymnospermoides, with six pairs of chromosomes, was the only species of the genus known cytologically (Raven, Solbrig, Kyhos and Snow, 1960). Since then I have had the opportunity to get a count on material of *Xanthocephalum Wrightii* from near Alpine, Arizona (*Solbrig 3218*, GH) which had only four pairs of chromosomes. In addition Dr. B. L. Turner[2] has also found n=4 for *Xanthocephalum linearifolium*, from La Cima Station, Distrito Federal, México (*Beaman 3653*, MSC). This eliminates one of the generic differences between *Xanthocephalum and Gutierrezia* (which has x=4). It is interesting to note that *Xanthocephalum Wrightii* is the species morphologically closest to *Gutierrezia*. Nevertheless, these results do not require a reassessment of the status of *Xanthocephalum* as a genus as outlined elsewhere (Solbrig, 1960).

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[2]I am grateful to Dr. Turner for permission to use this hitherto unpublished count.

TAXONOMIC TREATMENT

Xanthocephalum Willd. Ges. Naturf. Fr. Berlin. Mag. 1: 140. 1807. *Xanthocoma* HBK. Nov. Gen. et Sp. Plant. 4: 310. 1820. (Type: *X. humile* = *Xanthocephalum humile*). *Guenthera* Regel, Gartenflora 7: 44. 1858. (Type: *G. viscosa* = *Xanthocephalum gymnospermoides*). *Grindeliopsis* Sch. Bip. Bonplandia **6**: 356. 1858 (Nomen nudum).

Stout annuals or short-lived perennials, erect, glabrous to tomentose, often glandular-pubescent or resinous. Leaves petiolate, the cauline sometimes sessile, alternate, thin to subcoriaceous, linear-lanceolate to lanceolate, simple, entire, or divided. Heads solitary at the end of the branchlets, usually cymosely arranged, peduncles of variable length. Heads campanulate or hemispheric, involucral bracts in two to many rows, imbricate, yellowish, reddish or green, with or without green midribs and tips. Flowers pale to golden yellow, ligules usually more than twice the length of the involucre, numerous; tubular flowers campanulate, with a short tube and usually an expanded throat and five small triangular lobes; stamens five, tailless; styles of tubular flowers with triangular or elongate tips with collecting hairs occupying varying degrees of the outer surface of the stylar branches and with the stigmatic papillae always occupying the margins of the lower halves of the stylar branches below the collecting hairs; styles of ligulate flowers only papillate; pappus usually reduced to a low crown less than 0.5 mm. long, infrequently formed by short, irregular squamellae; achenes turbinate, swollen or flat, glabrous or tomentose.

TYPE SPECIES: *Xanthocephalum centauroides* Willd.

KEY TO THE SPECIES

A. Achenes white-hairy at maturity. Receptacle conical.....
.....6. *X. sericocarpum.*

A. Achenes glabrous or sparsely pubescent. Receptacle flat or convex, not conical.

B. Plants 5-10 cm. high with entire leaves with entire margins.....
.....2. *X. humile.*

B. Plants more than 20 cm. high, or if less, then with serrate-dentate leaves.

C. Leaves usually pinnatifid, sometimes serrulate, if serrulate then not glandular dotted.....1. *X. centauroides.*

C. Leaves entire or dentate, occasionally serrated.

D. Stems longitudinally grooved, without conspicuous glandular hairs.

E. Heads 1.5 cm. or more in diameter, ligules 15 mm. or more in length, leaves broad (5-10 mm.).....
.....8. *X. megalocephalum.*

E. Heads less than 1.5 cm. in diameter, ligules not more than 15 mm. in length, leaves narrow or broad.
F. Leaves linear, 1-2 mm. broad, ligules 1-2 mm. wide. Plants from an annual rootstock, usually profusely branched.....5. *X. Wrightii.*
F. Leaves lanceolate more than 2 mm. broad, ligules 3 mm. wide. Plants from a perennial rootstock, usually little branched.....3. *X. linearifolium.*
D. Stems round, with conspicuous glandular hairs.
G. Involucres glabrous-resinous, leaves usually entire, but sometimes with dentate or serrated margins.....4. *X. gymnospermoides.*
G. Involucres glandular-pubescent, leaves always dentate-serrate margined.....7. *X. Benthamianum.*

1. **Xanthocephalum centauroides** Willd. ex HBK. Nov. Gen. et Sp. 4: 312. 1820.

Pyrethrum Bonplandianum HBK. Nov. Gen. et Sp. 4: 300. 1820; *Xanthocephalum Bonplandianum* (HBK.) DC. Prodr. **6**: 44. 1837. Based upon *Humboldt & Bonpland* "in Mexici locis altis prope Valladolid de Mechoacan". *Xanthocephalum suffruticosum* DC. Prodr. **6**: 44. 1837. Based upon *Berlandier 538*, "circa urbem Mexici" (G!). *Grindelia coronopifolia* Lehm. Linnaea **5**: 376. 1830. Based upon cultivated material (presumably living) of the Botanical Garden in Hamburg. *Xanthocoma dentata* Schauer, Linnaea **19**: 723. 1847; *Xanthocephalum dentatum* (Schauer) Hemsley, Biol. Centr.-Am. Bot. 2: 111. 1881. Based upon *Aschenborn 10* "Mexico".

Annual or short-lived perennial, 15-50 cm. high. Shoots usually several from base, racemose branched, grayish-green or green, glabrous. Leaves lanceolate, 3-8 cm. long, 1-5 mm. wide, glabrous, borders usually serrate or toothed, sometimes almost entire, the teeth distinct and spaced. Heads cymosely arranged at the end of branchlets, involucres campanulate or hemispheric, 4-11 mm. wide, 3-6 mm. high; involucral bracts numerous, lanceolate, appressed, glabrous, arranged in 2-5 loose series, with green upper portions. Ligulate flowers 20-40, ligules 4-6 mm. long, 1-3 mm. wide, tube ca. 2 mm. long; tubular flowers numerous 40-60, with a very narrow tube expanding into an upper throat at least three times as wide; stylar branches with triangular tips covered with collecting hairs, and a long stigmatic portion. Pappus minute, achenes glabrous, terete or slightly appressed.

TYPE LOCALITY: Not known. (see under history of the genus).

DISTRIBUTION: Central México, from México City to San Luis Potosí and Durango.

MATERIAL STUDIED: **México.** DISTRITO FEDERAL. México City, *Orcutt 4112* (GH), *Pringle 6441* (GH, MICH, UC, US); près México, *Bourgeau 369* (GH, US); Valle de México, *Schmitz s. n.* (GH), *Schaffner 207* (GH); no loc., *Ghiesbreght 118* (GH). DURANGO. City of Durango and Vicinity, *E. Palmer 265* (GH, MICH, UC, US), *501* (GH, UC, US). SAN LUIS POTOSÍ. San Luis Potosí *Schaffner 312* (GH). VERA CRUZ. Mt. Orizaba, Maltrata, *Seaton 10* (GH, US).

2. Xanthocephalum humile (HBK.) Sch. Bip. ex Hemsley, Biol. Centr.-Am. Bot. 2: 111. 1881.

Xanthocoma humile HBK. Nov. Gen. et Sp. 4: 311. 1820; *Chrysanthemum humile* (HBK.) Spreng., Linn. Syst. ed. 16, 3: 584. 1826.

Annual or short-lived perennial herb 10-15 cm. high. Shoots few, unbranched from the base, brownish gray, glabrous and slightly fistulose. Leaves lanceolate, 0.5-5.0 cm. long, 0.5-3.0 mm. wide, the lower petiolate and large, forming a loose basal rosette, the upper sessile and short, glabrous, acute, entire. Heads solitary at the end of the branches, involucre hemispheric, 5-10 mm. wide, 3-6 mm. high; involucral bracts lanceolate, glabrous, arranged in two loose series, with midrib and tips green. Ligulate flowers 20-30, ligule 4-6 mm. long, tube 1-2 mm. long; tubular flowers 30-50, not more than twice the number of ligulate flowers, the corolla with a narrow tube app. 2 mm. in length provided with a few trichomes, broadening into an upper throat of same length and app. twice as broad; stigmatic branches of styles of tubular flowers with a triangular tip covered with collecting hairs and a lower papillate region; pappus a very short tube; achenes terete or prismatic, glabrous.

ILLUSTRATION: HBK. Nov. Gen. et Sp. 4: t. 412, 1820.

TYPE LOCALITY: "Crescit locis humidis Regni Mexicani, inter pagum Carpio et locum Sancti Christophori, Alt. 1180 hex. . ." *(Humboldt)*. (Not seen).

DISTRIBUTION: Central México. Known from a few localities in northern Puebla, México City and San Luis Potosí.

MATERIAL STUDIED: **México.** DISTRITO FEDERAL. Valle de México, *Schmitz 43* (GH), *Pringle 3202* (GH, UC, US), *Pringle 7422* (US); México, *Bourgeau 163* (GH, US). PUEBLA. Near Lago Salado, 253 km. e. of México City, *Weaver 865* (GH, US). SAN LUIS POTOSÍ. San Luis Potosí, *C. Parry and E. Palmer 525* (GH, US).

3. Xanthocephalum linearifolium (DC.) Greenman, Publ. Field Mus. Nat. Hist. Bot. 2: 345. 1912.

Keerlia linearifolia DC. Prodr. 5: 310. 1836; *Gutierrezia Alamani* Gray, Pl. Wright. 1: 91. 1852; *Xanthocephalum Alamani* (Gray) Benth. & Hook. ex Hemsley, Biol. Centr.-Am. Bot. 2: 109. 1881.

Rhizomatous perennial 10-35 cm. high, forming a dense mat. Shoots sparsely branched, greenish, somewhat fistulous, glabrous. Leaves 2-8 cm. long, 2-8 mm. wide, lanceolate-spathulate, acute, glabrous, the margins entire, sessile or with a poorly defined petiole. Heads solitary at the end of the branches, involucre hemispheric, 6-15 mm. wide, 4-6 mm. high; involucral bracts broadly lance-triangular, glabrous, glutinous, appressed in 2 or 3 loose series, with green tips. Ray flowers few (10-20), conspicuous, ligule 5-10 mm. long, 2-4 mm. wide, tube 2-3 mm. long; tubular flowers numerous (60-80), about 5 times more than ligulate flowers, corollas broadly campanulate, 3-4 mm. high; appendages of the style covered almost entirely by collecting hairs, the papillate region short; pappus variable, usually a short crown or formed by minute paleae; achenes turbinate, 1-2 mm. long, glabrous or pubescent, but never densely silky-pubescent.

TYPE LOCALITY: ". . . in Mexico . . ." *(Alaman)*. (Not seen).

DISTRIBUTION: Restricted to the valleys of México City and Toluca and neighboring areas.

MATERIAL STUDIED: **México.** DISTRITO FEDERAL. Cima Station, *Pringle 11613* (GH, MICH, US), *Moore 3439* (GH, US), *Orcutt 3784* (GH, US), *Lyonnet 841* (US), *Harshberger 120* (GH); 38 km. s. of México, *Hitchcock & Stanford 7039* (UC, US); 40 km. s. of México City, *Schoonberger 8562* (MICH); Valley of México, *Reiche 1* (US), *s. n.* (US). STATE OF MÉXICO. 12 mi. s. of Tlalpan, *W. E. & Margaret Manning 531040* (GH); calcareous bluffs, valley of Toluca, *Pringle 4195* (GH, MICH, UC, US); Las Cruces, *Hinton 1036* (US); 30 mi. w. of Toluca, *Hitchcock & Stanford 7217* (US).

4. **Xanthocephalum gymnospermoides** (Gray) Benth. & Hook. ex Rothrock, in Wheeler, U. S. Geogr. Survey W. of 100th meridian 6: 140. 1878. (Incorrectly ascribed to Benth. & Hook. Gen. Pl. 2: 249. 1873).

Gutierrezia gymnospermoides Gray, Pl. Wright. 2: 78. 1853. *Guenthera viscosa* Regel, Gartenflora 7: 44. 1858. (based on *Gutierrezia gymnospermoides*). *Grindeliopsis gymnospermoides* Sch. Bip. Bonplandia 6: 356. 1858 (nomen nudum).

Stout annual up to two meters tall. Stem with brownish-green bark, little branched at the base, somewhat more towards the top. Leaves lanceolate, of variable size, about 0.5-3.0 cm. broad and 3-15 cm. long,

glabrous, the margins entire, toothed or slightly serrated, acute, the upper surface shiny and somewhat glutinous, the midrib prominent on lower surface, sometimes somewhat reddish in color. Branchlets, flowering shoots and pedicels often reddish, with prominent capitate glands in varying density. Heads numerous, cymosely arranged in crowded groups at the end of the branchlets. Involucre campanulate, glutinous, 3-7 mm. in diameter and 3-6 mm. in height; involucral bracts numerous, arranged in two loose series, glabrous, glutinous, tightly appressed, usually with green midrib and tips, the ends usually spreading. Receptacle flat or slightly convex, alveolate. Ligulate flowers 50-70, yellow, ligules 2-4 mm. in length, 1-1.5 mm. wide, about the same length as the filiform tube; tubular flowers 150-200, two to three times as many as ligulate flowers, corolla about 4 mm. long, with a narrow tube and expanded throat; style with collecting hairs restricted to the short triangular tips. Pappus variable, sometimes a low crown, sometimes a few irregular awns up to half as long as the tubular corolla. Achenes terete, glabrous or slightly pubescent, 1-2 mm. long.

TYPE LOCALITY: "Low banks of the San Pedro, Sonora (now Arizona)" *Wright* (GH!).

DISTRIBUTION: Along the mountains, northwestern México from Durango to the Arizona border; area of the Huachuca Mts. in Arizona, and Davis Mts. in Texas.

MATERIAL STUDIED: **México.** CHIHUAHUA. Prezón Ortega, *Shreve 8894* (US), *I. M. Johnston 7935* (GH, US); Majalca, *LeSueur, Mex-242* (GH), *White 2378* (GH, MICH); Rio Sta. Maria, *Thurber 747* (GH); between Casas Grandes and Sabinal, *E. W. Nelson 6381* (US), *6379* (GH, US); near Colonia Juárez, *E. W. Nelson 6321* (GH, US); 40 mi. from Guadalupe y Calvo, *E. W. Nelson 4815* (GH, US); Memelichi, Rio Mayo, *Gentry 2736* (GH, UC, US); Loreto, Rio Mayo, *Gentry 2573* (GH, UC, US); s.w. Chihuahua, *E. Palmer 439* (GH, US); near Parral, *Goldman 127* (GH, US). DURANGO. 5 mi. s.w. of Guadalupe Victoria, *Gentry 8412* (GH, MICH, UC); El Salto to Pueblo Nuevo, *Maysilles 7752* (MICH); Otinapa, *E. Palmer 455* (US). SONORA. Cananea, *Ponnelly 7* (UC). **United States.** ARIZONA. Cochise Co.: San Pedro River, *Smart 404* (US); W. of Huachuca Mts., *Shreve 7728* (MICH); Ft. Huachuca, *Patzky 38* (US); Ramsey Canyon, Huachuca Mts., *Hood 181* (US); Huachuca Mts., *M. E. Jones s. n.* (US), *Lemmon 2738* (GH, UC, US); near Ft. Huachuca, *Wilcox 38* (US). Pima Co.: Silver Lake, near Tucson, *Toumey 608* (US); Sacaton, *G. J. Harrison 6016* (GH). Santa Cruz Co.: Alkaline plains, *Pringle s. n.* (GH, US); Patagonia Mts., *Kearney & Peebles 14832* (US); near Nogales, *Peebles & Harrison 4726* (US); Nogales, *Hood 174* (US); South Arizona, *Rothrock 667* (GH, US). TEXAS. Davis Co.: Ft. Davis, *Reed 866* (US); Davis Mts., *Young s. n.* (UC).

NOTE: Some of the specimens from Chihuahua *(Gentry 2736, 2573)* were devoid of ligulate flowers, although undistinguishable from normal ligulate plants in all other respects. This rayless form which apparently is geographically isolated might deserve varietal status. Nevertheless, since in some Compositae raylessness has proved to be determined by a single gene, it is felt that before giving formal recognition to this form, more work, especially of an experimental nature, is needed.

5. **Xanthocephalum Wrightii** (Gray) Gray, Proc. Am. Acad. 8: 632. 1873.

Gutierrezia Wrightii Gray, Pl. Wright. 2: 78. 1853.

Stout annual not more than 75-100 cm. high. Shoots striate, often branching from the base. Leaves linear-lanceolate, usually 4-6 cm. in length, occasionally up to 10 cm. long, not more than 3-5 mm. wide, surface glabrous, the margins entire, sometimes short-ciliate. A loose basal rosette of leaves is present in young plants, but absent in more mature ones. Heads disposed in loose, cymose arrangements. Involucre hemispheric, 4-10 mm. wide, 4-6 mm. high; involucral bracts imbricated, appressed, glutinous, with a green tip, sometimes slightly spreading. Ray flowers few (14-20), with a long and showy ligule 5-7 mm. long, 2-3 mm. wide and a short tube, 2-3 mm. long; tubular corollas about four times more numerous than the ligulate ones (50-60), with a broad throat and short tube; style of tubular flowers with long subulate appendages covered with collecting hairs and with only a short lower papillate portion; pappus a low crown; achenes terete, glabrous, somewhat striate, 1-2 mm. long.

TYPE LOCALITY: "between Barbacomori and Santa Cruz, Sonora" *Wright 1177* (GH!).

DISTRIBUTION: Northwestern México (Chihuahua, Durango, and Sonora) and southwestern United States (Arizona and New Mexico), in moist places at mid-altitudes in the mountains.

MATERIAL STUDIED: **México.** CHIHUAHUA. Cañon de San Diego, *Lumholtz 765* (GH, US); near Colonia Garcia, *E. W. Nelson 6203 a* (GH, US), *Townsend & Barber 304* (GH, UC, US); 5 mi. S. of Garcia, *Leopold 234* (UC); near Chichupa, *Townsend & Barber 421* (GH, UC, US); lake near Chichupa, *LeSueur 1370* (GH); Chuhuichupa, *LeSueur 992* (GH); Sierra Madre, *E. W. Nelson 6307* (GH, US), *Pringle 1631* (UC); foothills, base of Sierra Madre, *Pringle 1280* (GH, MICH, US), *1629* (UC); los Cascarones, Rio Mayo, *Gentry 2681* (GH, UC, US); Canelo, Rio Mayo, *Gentry 2008* (GH, UC, US); Majalca, *Le Seuer, Mex-30* (GH, UC); 38.2 mi. w. of viejas Casas Grandes, *Tucker 2489* (UC, US). DURANGO. City of Durango, *E. Palmer 823* (UC, US), *E. W. Nelson 4623* (US); 34 mi. w. of Ciudad Durango, *Maysilles 7547* (US). SONORA. El Rancho del Roble, *White 4261* (GH, MICH), *4247* (MICH);

between Las Tierritas and El Tigre, *Phillips 684* (GH, MICH), *White 3451* (GH, MICH); Las Tierritas del Temblor, *White 3410* (GH, MICH); Barbacomori to Sta. Cruz, *Thurber 1007* (GH); El Billito, *White 4834* (MICH). **United States.** ARIZONA. Apache Co.: 8 mi. n. of Hannagan Meadow, White Mts., *Kearney & Peebles 12428* (GH); White Mts. *Gould & Robinson 4978* (UC); Mc Nary, *Whitehead 1633* (MICH); Buffalo Junction, *Solbrig 3218* (GH), *Parker & McClintock 7643* (UC, US). Cochise Co.: Mule Mts., *Harrison & Kearney 6236* (GH); Rucker Canyon, Chiricahua Mts., *Gould & Haskell 4603* (GH); Chiricahua Mts., *Lemmon s.n.* (UC); Carr Peak, Huachuca Mts., *Goodding 869* (GH, US); upper Miller Canyon, Huachuca Mts., *Goodding 420* (GH); Reef Mine, Huachuca Mts., *Darrow, Phillips, Gould & Pultz 1418* (GH); Ramsey Canyon, Huachuca Mts., *Shreve 5038* (MICH), *M. E. Jones s. n.* (GH, UC); Huachuca Mts., *Peebles, Harrison & Kearney 3387* (US), *Harrison & Kearney 5777* (US), *Holzner 2025* (US), *Shreve 5074* (UC), *Gould, Darrow, Phillips & Pultz 2486* (UC), *Gould & Haskell 3375* (UC); Santa Cruz Co.: Wrighton Peak, Santa Rita Mts., *Clark 12310* (GH); Santa Rita Mts., *Griffiths & Thornber 169* (US); near Washington, Patagonia Mts., *Kearney & Peebles 10107* (MICH, US); Roberts Ranch, *Wooton s. n.* (US). NEW MEXICO. Catron Co.: Mogollon Mts., *Wooton s. n.* (US), *Saunders s. n.* (UC), *Metcalfe 458* (US); Grant Co.: Pinos Altos Mts., *Greene 200* (GH); Black Range, *Pilsbury s. n.* (US); Black Mts., *Archer 358* (MICH); Silver City, *Holzinger s. n.* (US); Head of Cow Creek, *Eggleston 16030* (GH); Iron Creek, *Metcalfe 1481* (GH, UC, US).

6. **Xanthocephalum sericocarpum** Gray, Proc. Am. Acad. **15**: 31. 1880.

Xanthocephalum conoideum Hemsley, Biol. Centr.-Am. Bot. **2**: 110. 1881. Based upon *Coulter 299*, "Real del Monte to Zacatecas" [Mexico] (K) (Isotype GH!).

Stout annual 30-50 cm. tall, usually branching profusely from the base. Shoots greenish, fistulous, less than 5 mm. in diameter at the base and not more than 1-2 mm. at the upper ends, glabrous, often with minute bracteoles. Leaves linear, 3 to 5 cm. long, 1-3 mm. wide, glabrous, acute, border entire, petiole very short or absent. Heads solitary at the end of branchlets, sometimes forming a loose cyme. Involucres hemispheric, 6-12 mm. wide, 5-7 mm. high, involucral bracts broadly lanceolate, acute, tightly appressed in two loose rows, with green tips and midribs; receptacle conical, grooved; ligulate flowers 25-40, ligules 6-12 mm. long, 2-3 mm. wide, tube 2-3 mm. long; tubular flowers 100-150, about four times as many as ligulate flowers, the tube broadly campanulate, 2-3 mm. long; styles of tubular flowers with the distal halves of the stigmatic portions covered with collecting hairs, the lower half papillate; pappus a relatively well

developed crown, 0.5 to 1.5 mm. long; achenes terete, silky pubescent at maturity.

TYPE LOCALITY: "Near San Luis Potosi . . ." *Parry and Palmer 369* (GH!).

DISTRIBUTION: Northern México, from Jalisco and Querétaro northward.

MATERIAL STUDIED: **México.** CHIHUAHUA. Pine plains, base of Sierra Madre, *Pringle 1278* (GH, MICH, US); Namaquipa, *LeSueur, Mex-337* (GH); near Balleza, *Goldman 141* (GH, US); 12 mi. w. of San Antonio, *C. Muller 3380* (GH, MICH, US); southwestern Chihuahua, *E. Palmer 412* (GH, US); Mapula Mts., *Pringle 1150* (GH); 34 mi. s. of Parral, *Waterfall 12528* (MICH). DURANGO. City of Durango and vicinity, *E. Palmer 823* (GH), *143* (GH, MICH, UC, US); Sandía Station, *Pringle 13580* (GH, MICH, US); 34 mi. w. of Durango, *Maysilles 7547* (MICH), *7689* (MICH, US). JALISCO. Road between Huajnilla and Mesquite, *Rose 2560* (US). QUERÉTARO. Cazadero Station, *Pringle 10066* (GH, UC, US); 15 mi. se. of San Juan del Rio, *Waterfall 13987* (US). SAN LUIS POTOSÍ. San Luis Potosí, *Schaffner 744* (US).

7. **Xanthocephalum Benthamianum** Hemsley, Biol. Centr.-Am. Bot. 2: 110. 1881.

Stout annual 20-50 cm. tall with little or no branching from the base, and only slightly branching above. Stems greenish, greenish brown or reddish, slightly fistulous at times, 1-3 mm. in diameter, usually covered with capitate glands, especially in the upper portions. Leaves broadly lanceolate, 2-8 cm. long, 5-10 mm. wide, the lower shortly petiolate, the upper ones sessile, glabrous or slightly pubescent, the margins coarsely serrate. Heads solitary at the end of branchlets, sometimes arranged in loose cymes. Involucres campanulate, 8-15 mm. broad, 4-7 mm. high; involucral bracts numerous, variously covered with capitate glands, loosely arranged in several series, the upper portions green, the tip usually extended. Ligulate flowers 30-40, ligules 6-10 mm. long, tube app. 2 mm. long; tubular flowers numerous (100-200), four to six times as many as the ligulate, the very narrow tube followed by a wide throat; tips of stylar branches triangular, covered with collecting hairs, and with a large papillate region. Pappus a low crown; achenes terete, glabrous, 1-2 mm. high.

TYPE LOCALITY: "South México, Aguas Calientes" *Hartweg 110* (Isotype GH!).

DISTRIBUTION: Central México, from México City to Durango.

MATERIAL STUDIED: **México.** AGUASCALIENTES. *Hartwegg 110* (GH). DURANGO. W. of Durango, *Forber 17* (UC); 5 mi. n. of Coyotes, *Maysilles 8171* (MICH); Coyotes Hacienda, *Maysilles 7853* (MICH); 60 mi. sw. of Durango, *Maysilles 7781* (MICH); Rio Chico, *Maysilles 7656* (MICH). STATE OF MÉXICO. Del Rio, *Pringle 5336* (GH). MICHOACAN.

Patzcuaro, *Kenoyer 1690* (GH). SAN LUIS POTOSÍ. Chiefly in the region of San Luis Potosí, *C. Parry & E. Palmer 526* (GH, UC). ZACATECAS. Near Plateado, *Rose 2720* (US).

NOTE: *Xanthocephalum Benthamianum* is closely allied to *X. gymnospermoides* and might possibly be only a southern form of this last species. The serrated leaves and the glandular dotted involucres, the increased general pubescence and the more southern distribution (with a considerable overlap) of *X. Benthamianum* seem nevertheless sufficient specific distinction from a typological point of view. Only field studies and crossing experiments which are lacking at present can determine the true status of *X. Benthamianum*.

8. **Xanthocephalum megalocephalum** Fernald, Proc. Am. Acad. **36**: 505. 1900.

Rhizomatous perennial 30-70 cm. high. Stems glabrous, greenish, slightly fistulous, little or not branched at the base, moderately so above. Basal rosette leaves spatulate-lanceolate when present, 10-15 cm. long, 5-10 mm. broad, petiolate, acute, glabrous. Cauline leaves sessile, lanceolate, 4-6 cm. long, 5-15 mm. broad, glabrous. Heads borne singly or in pairs at the end of branchlets; involucre hemispheric, 10-20 mm. broad, resinous, with a green tip; ligulate flowers 15-30, ligules large, 12-20 mm. long, the tube 3 mm. long; tubular flowers 80-100, about four times as many as ligulate flowers, campanulate, with a short tube and broad throat; stigmatic branches subulate, almost completely covered with collecting hairs, the stigmatic papillae restricted to the lower portion; pappus a short crown not more than half a millimeter in length. Achenes terete, 1-2 mm. long, glabrous.

TYPE LOCALITY: "Chihuahua, Mt. Mohinora" *E. W. Nelson 4890* (GH!).

DISTRIBUTION: Uncommon in northern Durango and western Chihuahua, México.

MATERIAL STUDIED: **México.** CHIHUAHUA. Near Guachichi, *Goldman 174* (GH, US); along road to Parral, near San Julián, *E. W. Nelson 4932* (GH, US); Sierra Madre, *Pringle 1630* (UC), *1279*, (GH, UC, US); mountains north of Chihuahua, *LeSueur 1377* (GH). DURANGO. State of Durango, *Ibarra Garcia 412* (US).

NOTE: This rare species shows close similarities to *X. Wrightii* and to *X. linearifolium*. Nevertheless the large heads and long ligules were sufficiently distinct to permit an easy identification of *X. megalocephalum* in the material studied. — GRAY HERBARIUM, HARVARD UNIVERSITY.

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ROOTS AND THE TAXONOMIC DIFFERENCES BETWEEN BOTRYCHIUM ONEIDENSE AND B. DISSECTUM

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Since first distinguished nearly sixty years ago, the plant here treated as *Botrychium oneidense* (Gilbert) House has been a continuous source of taxonomic disagreement. It has been interpreted as a variety of *B. multifidum* (Gmel.) Rupr. or as a variety of *B. dissectum* Spreng. (Wagner, 1960a). It was originally described as a variety of a third species, *B. ternatum* (Thunb.) Sw. Only House (1921) seems to have recognized *B. oneidense* as a distinct species; but he changed his mind just three years later, and made it a vari-

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